INTERMOUNTAIN STATION
Central Reference File
No. 073

RECEIVED
MAY 2 - 1946
RESEARCH
INTERMOUNTAIN

United States Department of Agriculture
NORTHEASTERN FOREST EXPERIMENT STATION
FOREST SERVICE

Forest Management Note No. 1
January 30, 1946

614 Bankers Securities Bldg.
Philadelphia 7, Pennsylvania

IMPROVEMENT OF SECOND GROWTH NORTHERN HARDWOODS BY CORDWOOD THINNINGS

By A. F. Hough

Thinnings in well stocked 40-50 year old second growth northern hardwoods on good sites give the following results:

(1) Improve the periodic volume growth per acre within 2-4 years after treatment. Untreated stands grow at the rate of 1.0 to 1.2 cords per acre per year during the first 40 to 50 years and at an even slower rate during the last 5 years. After the proper degree of thinning the residual stand grows at the rate of 1.4 to 1.8 cords per acre per year, while unthinned stands continue at the 1.0 to 1.2 cord rate.

(2) Increase the proportion of straight, clean-boled, healthy trees through removal of defective poor-risk individuals.

(3) Increase the proportion of fast and average good growers, i.e. the vigor 1 and 2 trees in the reserved stand.

(4) Increase the proportion of desirable species in the residual stand in many cases.

These results were shown on a series of thinned and check plots examined recently on the Allegheny National Forest where commercial thinnings for chemical and pulpwood have been made for stand improvement purposes during the past 4 years. In addition to the above objectives these thinnings have supplied large volumes of cordwood material to industry, wages to the wood cutters, operator profits, and have provided better habitat and food conditions for game.

The selected stands were better than average in species composition and ran 3100 to 5200 cubic feet or about 43 to 72 cords per acre 1/ of trees 4 inches in diameter and larger. Thinning removed an average of 19.2

1/ Based on total cubic foot volume tables to 2" top including limbwood and bark; 72 cu.ft. per cord of 52" chemical wood.

cords per acre, chiefly the forked, limby black cherry of sprout origin, defective holdover beech and poor risk yellow and black birch, red maple and sugar maple. The thinned plots increased their average periodic annual growth to 1.4 cords per acre during the succeeding 2 to 4 year period as compared to an average of 1.2 cords for the same period on the unthinned check plots.

Similar check and thinned plots on the Kane Experimental Forest, 6 miles away, indicate that the unthinned stands grew 1.0 cord and thinned stands 1.8 cords per acre per year during the period 1933-43. Evidently the rate of growth after thinning builds up as the crowns and root systems of the reserved trees expand and develop in openings and as small saplings and poles grow into merchantable size. Competition is expected to again slow down the growth rate after 10 years.

Bole form in the untreated check plots was 70% straight and 30% crooked or forked. After thinning, the reserved stand was 81% straight boled and only 19% crooked or forked. Healthy and slightly injured trees made up 63% and rotted or seriously defective trees 37%, of the untreated stand. Removal of a greater proportion of the poor trees by thinning left 71% healthy or slightly injured and only 29% defective trees in the reserved stand.

In this study all trees were classified into three vigor classes based on such external indications as fullness of crown, foliage density, size and color of leaves, and presence or absence of dead branches in the top. The proportion of vigor 1 and 2 trees, the fast and average good growers, was increased from 62% on unthinned plots to 78% after thinning. Vigor 3 trees, the slow growers, amounted to 38% on untreated plots but was reduced to 22% after thinning. Cutting of a higher proportion of low vigor trees by thinning is the main reason for this improvement though some vigor 3 trees released by thinning may have moved up to vigor 2 in the 2-4 years since thinning.

There is a close relationship between the vigor classes recognized and the rate of annual diameter growth for each group. This was tested by boring 650 reserved trees 4" dbh and larger on 17 fifth-acre sample plots in thinned stands. The effect of thinning on the mean annual diameter growth of three vigor classes 10 years before and 2-4 years after cutting is also shown by measurements on these cores:

Periodic mean annual growth in diameter
of all species 4" dbh and larger in
reserved stand on thinned plots by vigor classes

(Basis 17 1/5 acre plots)

Period and stand condition at the time	Vigor 1	Vigor 2	Vigor 3	All classes
		Inches		
10 years before thinning	.18	.11	.08	.12
Same stand, 2-4 years after thinning	.22	.15	.10	.15
No. trees - basis	169	342	139	650

Species composition was changed but little since the volume in undesirable species before thinning was rather small in the stands studied. Weedings or first improvement cuttings in younger age classes may be expected to remove the pioneer undesirable species and thus improve stand composition.

Observations on these recently thinned stands, and plots thinned 12 and 18 years ago, indicate a substantial increase in wildlife cover and food. Buds and twigs of freshly cut trees were browsed by deer and rabbits during the winter. Sprouts from cut stumps, beech root suckers, and seedling tree reproduction, increased the low cover and also provided food in the thinned stand. Shrubby and herbaceous plants greatly increased in abundance and these natural food patches will remain useful for at least 10 years as shown by the results of older thinnings.

Condensed rules for making chemical or pulpwood thinnings as a stand improvement measure are as follows:

(1) Remove the poor risk low vigor trees, especially those with defects of form or health, providing they are merchantable and can be worked up economically by the wood cutter. See Allegheny Station Technical Notes 31 and 34 regarding conversion costs.

(2) Leave a full growing stock of well-formed, healthy, potentially fast growing crop trees to take advantage of the openings made by thinning. These may be straight, sound, but formerly over-topped sugar maple, red maple, or beech, or the better formed codominant black cherry. (Do not leave yellow or black birch exposed.)

(3) Do not attempt to remove all the poor elements in the first thinning; in many stands this will result in too heavy a cut. A first thinning should remove not over 30-40 percent of the total basal area or cubic foot volume. On sites subject to glaze or wind damage it will be desirable to remove even lighter cuts to avoid large breaks in the canopy.

Thinnings as suggested, with the objective of leaving the stand in good condition for future cuts, will attain the results discussed, when applied to well stocked 40-60 year old second growth northern hardwood stands on good sites. The expected periodic annual growth after thinning, will be increased by 0.2 to 0.8 cord per acre. Unwise removal of too great volume will leave an inferior growing stock and decrease future production.